NASA Technical Memorandum 83241 NASA-TM-83241 19830002296

NECAP 4.1 - NASA'S ENERGY-COST ANALYSIS FAST INPUT MANUAL AND EXAMPLE

RONALD N. JENSEN AND DAVID L. MINER

AUGUST 1982

National Aeronautics and
Space Administration

Langley Research Center
Hampton, Virginia 23665

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Section 1

INTRODUCTION

This manual is one in a set of NECAP manuals referenced below that describes the computer program NECAP - NASA's Energy Cost Analysis Program. The program is a versatile building design and energy analysis tool which has embodied within it, state-of-the-art techniques for performing thermal load calculations and energy use predictions. With the program, comparisons of building designs and operational alternatives for new or existing buildings can be made.

This manual describes how to prepare NECAP data using the powerful defaults combined with the simple modeling technique. The "FAST" method will save time in data preparation, and program execution. Due to the fact that the amount of input errors are reduced, the number of potential fatal execution errors are also reduced. The result is a faster energy analysis. NECAP 4.1 is documented in the following manuals:

TM 83238 NECAP Users Manual - Describes the input procedures, provides examples and output from the program.

TM 83239 NECAP Input Manual - Details the input requirements.

TM 83240 NECAP Engineering Manual - Provides the algorithms for the program.

TM 83241 NECAP Fast Input Manual and Example - Provides a simple method of preparing NECAP input.

TM 83242 NECAP Engineering Flowcharts Manual - Provides flowcharts of routines outlined in the Engineering Manual.

CR-165802 NECAP Operations Manual - Provides specific operating instruction for CDC computer system operation of NECAP at Langley Research Center.

NASA's ENERGY ANALYSIS PROGRAM
Version 4.1

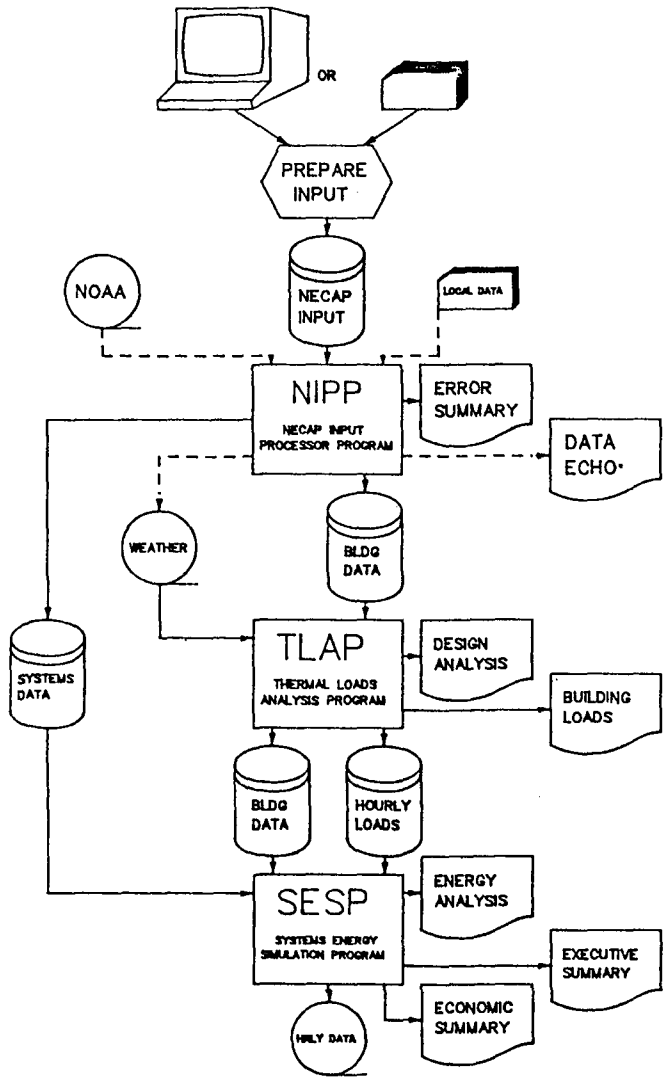

Figure 1

Section 2

FAST INPUT FORMAT

The FAST INPUT method uses the same card input as the full NECAP INPUT method, except most cards are defaulted. The NECAP INPUT MANUAL contains a detailed explantation of each card.

The FAST INPUT surface cards differ from the FULL INPUT surface cards in that the input order has been changed requiring less input. Figure 2 shows the format for each type of card used by the FAST INPUT method. The FAST INPUT FORM also allows for additional cards which may be used to add needed detail to the input model.

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)		Location (35 char max)	
L1=	/		;

Engineer (35 char max)		Project No. (15 char max)	
L1=	/		;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=	;	1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

Figure 2

Section 3
EXAMPLE RUN

The building modelled is the Systems Engineering Building, SEB, located at NASA's Langley Research Center in Hampton, Virginia. The SEB is a 53000 square foot, single story, structure providing office space for approximately 300 people. A variable volume fan system is used to provide ventilation. Refrigeration for cooling is done by a 180 ton Lithium Bromide Absorption chiller. Both heating and cooling use hot water from a central boiler. Special cards are added to suppliment the model. In this case the building orientation, type of chiller and special pumps were input to the NECAP simulation.

ONE ZONE MODEL INPUT

```
 1 C          NECAP FAST INPUT CARDS
 2 L1=SEB 81209/HAMPTON, VA/D.L. MINER /ONE ZONE MODEL;
 6 L11-F=,2978,8,0,90;WALL 1
 7 L11-F=,2749,8,90,90;WALL 2
 8 L11-F=,2978,8,180,90;WALL 3
 9 L11-F=,2749,8,270,90;WALL 4
10 L11-F=,53000,12,0,0;ROOF
11 L13-F=,662,.8,0,90;WINDOW 1
12 L13-F=,441,.8,90,90;WINDOW 2
13 L13-F=,662,.8,180,90;WINDOW 3
14 L13-F=,441,.8,270,90;WINDOW 4
15 L15-F=,12000,.1;FLOOR 1
16 L15-F=,41000,.02;FLOOR 2
17 L17=,53000,,,,300,,,,,2.67,,,,4.0,,,,1,1.0;MAIN ZONE
18 S11=12;VARIABLE VOLUME
19 C   MISCELANEOUS CARDS (OPTIONAL)
20 L2=300;BUILDING AZIMUTH
21 S19=10,4,1;PROCESS LOAD
22 S15=4;ABSORBTION CHILLER
```

EXPLAINATION

(1) The title card puts the header information into the program. Items included are: building name, location engineer, and project ID. (date is defaulted)

(2) Exterior surface cards all use the FAST format which requires: type of card, surface area, type of heat transfer input (depending on type of surface), azimuth and tilt. (standard cards may be used)

(3) Underground surface cards also use the FAST format but require only the surface area and U factor.

(4) The space card is used to input internal conditions which affect the space loads (area, people, lights, equipment, and infiltration).

(5) Fan system card is used to specify the type of distribution system that is to be simulated.

NOTE: IF SYSTEMS ENERGY SIMULATION PROGRAM is to be run, at least one "S" card must be input.

(6) Miscelaneous cards are used to overide or enhance NECAP's defaults. In this case, the building orientation, type of chiller, and a process load are specified in the input for the simulation.

Figure 3.1

NOTE -- All defaulted values are given in Appendix B

THERMAL LOADS REPORT

BUILDING LOAD SUMMARY FOR
SEB 81209
HAMPTON, VA

SPACE NOS. 1 THRU 1

TOTAL FLOOR AREA (SQ.FT.) 53000.

TOTAL VOLUME (CU.FT.) 530000.

SUMMER COOLING PEAK: AUG. 20 AT HOUR 18
DBT= 89 WBT= 79 WND SP= 12

WINTER HEATING PEAK: DEC. 31 AT HOUR 7
DBT= 15 WBT= 12 WND SP= 14

	***** SUMMER LOAD ***** SENSIBLE (BTUH)	LATENT (BTUH)	WINTER LOAD (BTUH)
WALLS	16466.	0.	-47448.
CEILINGS	171368.	0.	-332505.
WINDOW CONDUCTANCE	47566.	0.	-174057.
WINDOW SOLAR	82642.	0.	6443.
QUICK SURFACES	0.	0.	0.
INTERNAL SURFACES	0.	0.	0.
UNDERGROUND SURFACES	16160.	0.	-44440.
OCCUPANTS	78530.	44360.	5.
LIGHT TO SPACE	401907.	0.	36.
EQUIPMENT TO SPACE	12009.	0.	1.
INFILTRATION	158096.	420668.	-741046.
SUBTOTAL	984743.	465028.	-1333011.
RETURN AIR	0.	0.	0.
FAN HEAT	39076.	0.	39076.
VENTILATION AIR	91142.	234657.	-366183.
TOTAL	1114961.	699685.	-1660118.

TOTAL BUILDING COOLING 1814646. BTUH 151.2 TONS
TOTAL BUILDING HEATING -1660118. BTUH -1660.1 MBH

	******* VARIABLE VOLUME SYSTEM *******	******* CONSTANT VOLUME SYSTEM *******
SUPPLY AIR AT 52 F AT DIFFUSER	48674. CFM .92 CFM/SQ.FT. MAX.	48674. CFM .92 CFM/SQ.FT. CONST.
SUPPLY AIR AT 120 F AT DIFFUSER	22911. CFM .43 CFM/SQ.FT. MAX.	22911. CFM .43 CFM/SQ.FT. CONST.

Figure 3.2

FINAL ENERGY SUMMARY

****

* EXECUTIVE SUMMARY *

SEB B1209

HAMPTON, VA

****

THIS NECAP RUN PREPARED BY: D.L. MINER

ON: JUL 27, 1982

LOADS CASE IDENTIFICATION : ONE ZONE MODEL

SYSTEMS CASE IDENTIFICATION : SEB B1209

****

* INPUT SPECIFICATIONS

LENGTH OF STUDY = 365 DAYS

TOTAL FLOOR AREA = 53000.00

HEATING	1488.3 KBH,	.02808 /SQFT
COOLING	133.8 TNS	.00252 /SQFT
SUP AIR	77352.1 CFM	1.45947 /SQFT
VNT AIR	0.0 CFM	0.00000 /SQFT

-----ENERGY SOURCE-----	-----BUILDING----- CONSUMPTION	--BUILDING LINE-- KBTU/SQ.FT.	---RAW SOURCE--- KBTU/SQ.FT.
ELECTRICITY (KWHR)			
LIGHTS & MISC. EQUIP.	338568.30	21.80	74.13
HEATING	38473.01	2.48	8.42
COOLING	94821.26	6.11	20.76
FANS	88961.58	5.73	19.48
PROCESS	25100.00	1.62	5.50
TOTAL	585924.14	37.73	128.29
GAS (THERM)	NONE USED FOR THIS MODEL		
PURCHASED STEAM (KLBS) (1000 BTU/LB)			
HEATING	1582.34	29.86	41.50
COOLING	2802.81	52.88	73.51
PROCESS	0.00	0.00	0.00
TOTAL	4385.15	82.74	115.01
HEATING OIL (KGALS)	NONE USED FOR THIS MODEL		
DIESEL FUEL (KGALS)	NONE USED FOR THIS MODEL		
TOTAL ENERGY USAGE (EQUIV KBTU)	6384911.10	120.47	243.29

Figure 3.3

APPENDIX A

At NASA's Langley Research Center in Hampton, Virginia, a front end processor is available to prepare and submit a FAST METHOD NECAP simulation. The program can only handle single zone, single story, rectangular shaped buildings. However, the input is much simpler than the standard FAST method because the program will compute the surface areas and many other required input data components. The front end processor, called GONECAP, is a FORTRAN V program which is run directly from the interactive terminal.

GONECAP requires building length, width, height, window size, door size, and space data to develop the building envelope model. Azimuth angle, cooling plant type and internal space loads are also input. Any miscellaneous cards may be entered from the terminal. All of the numerical data must be entered as floating point or real numbers. Defaulted input or null input is entered with a carriage return in most cases. The program will also give delayed surface type and fan system type codes which are required for input if the user requests. The next few pages show a sample run including the terminal input, NECAP input, and NECAP OUTPUT.

GONECAP at the time of this writing is only avialable at Langley Research Center's CONTROL DATA COMPUTER COMLPEX. The program contains CDC extended FORTRAN statements and issues CDC NETWORK OPERATING SYSTEM (NOS) instructions to submit a NECAP run. Therefore GONECAP is only supported to be compatable with LARC's NECAP operation.

```
'get,npc/un=[redacted]
/begin,gonecap,npc

   NECAP FAST INPUT PROGRAM

HIT CR. FOR DEFAUT

ONLY SINGLE ZONE MODELS CAN BE INPUT
NECAP ASSUMES A 4 SIDED SINGLE STORY BUILDING

ENTER ALL NUMERIC DATA AS REAL NUMBERS.

 ENTER FACILITY NAME    ? systems engineering building
 ENTER FACILITY LOC.    ? nasa langley research center
 ENTER ENGINEERS NAME   ? r. n. jensen
 ENTER PROJECT NUMBER   ? b1209
ENTER BUILDING AZIMUTH (COMPASS HEADING OF FRONT)  ?? 120.
 ENTER BUILDING LENGTH (NO DEFAULTS)  ? 240.
 ENTER BUILDING WIDTH  (NO DEFAULTS)  ? 220.
 ENTER BUILDING HEIGHT (NO DEFAULTS)  ? 14.

ENTER DATA TO DESCRIBE THE  FRONT  WALL

  THE TOTAL SURACE AREA IS     3360.0.
  ENTER THE AREA OF GLAZED SURFACE (>1=SQFT. <1=%) ?? 662.
  ENTER ASHRAE SHADING COEFFICENT FOR WINDOW (DEF=0.0) ?? .8
  ENTER SQFT AREA OF ANY DOORS,PANELS ETC. ON THIS WALL??
  ENTER SURFACE CODE(DEF=8. IF LIST DESIRED ENTER 100.)?? 100.
```

```
TYPES OF WALL & ROOF SURFACES
 1. WALL- WOOD SIDING/SHEATHING/4"AIR SP/GYP BOARD
 2. WALL- SAME AS 1 BUT W 4" ISULATION
 3. WALL- 4"BRICK/.5"AIR SP/SHEATHING/4" INSUL/GYPBOARD
 4. WALL- 8"BLOCK
 5. WALL- 12" CONCRETE
 6. WALL- 12" BLOCK/2"AIR SP/ GYP BOARD
 7. WALL- 4"BRICK/2"AIR SP/6"BLOCK
 8. WALL- 4"BRICK/2"AIR SP/6"BLOCK/2"INSUL/GYP BOARD
 9. WALL- SHEET METAL/2" DNS INSUL/SHEET METAL
10. WALL- METAL SIDING/1"DNS INSUL/8"BLOCK/AIR/GYP BOARD
11. ROOF- BUILT-UP ROOF/2"INSULATION/METAL PAN
12. ROOF- BUILT-UP ROOF/3"CELL GLASS/METAL PAN
13. ROOF- SAME AS 12 BUT WITH SUSPENDED CIELING
14. ROOF- BUILT-UP ROOF/2"CELL GLASS/4"LW CONC/MET PAN/SUSP CIEL
15. ROOF- SHEET METAL/6" INSUL/GYP BOARD
16. ROOF- STANDARD PITCHED ROOF
  ENTER SURFACE CODE(DEF=8. IF LIST DESIRED ENTER 100.)?? 8.

ENTER DATA TO DESCRIBE THE RT SIDE WALL

  THE TOTAL SURACE AREA IS     3080.0.
  ENTER THE AREA OF GLAZED SURFACE (>1=SQFT. <1=%) ?? 441.
  ENTER ASHRAE SHADING COEFFICENT FOR WINDOW (DEF=0.0) ?? .8
  ENTER SQFT AREA OF ANY DOORS,PANELS ETC. ON THIS WALL??
  ENTER SURFACE CODE(DEF=8. IF LIST DESIRED ENTER 100.)??

ENTER DATA TO DESCRIBE THE  REAR   WALL

  THE TOTAL SURACE AREA IS     3360.0.
  ENTER THE AREA OF GLAZED SURFACE (>1=SQFT. <1=%) ?? 662.
  ENTER ASHRAE SHADING COEFFICENT FOR WINDOW (DEF=0.0) ??
  ENTER SQFT AREA OF ANY DOORS,PANELS ETC. ON THIS WALL??
  ENTER SURFACE CODE(DEF=8. IF LIST DESIRED ENTER 100.)??
```

```
ENTER DATA TO DESCRIBE THE LF SIDE WALL

  THE TOTAL SURACE AREA IS     3080.0.
  ENTER THE AREA OF GLAZED SURFACE ()1=SQFT. <1=%) ?? 441.
  ENTER ASHRAE SHADING COEFFICENT FOR WINDOW (DEF=0.0) ?? .8
  ENTER SQFT AREA OF ANY DOORS,PANELS ETC. ON THIS WALL??
  ENTER SURFACE CODE(DEF=8. IF LIST DESIRED ENTER 100.)??

ENTER TYPE OF ROOF (DEFAUT= 13.     - IF LIST DESIRED ENTER 100.)?? 100.

TYPES OF WALL & ROOF SURFACES
 1= WALL- WOOD SIDING/SHEATHING/4"AIR SP/GYP BOARD
 2= WALL- SAME AS 1 BUT W 4" ISULATION
 3= WALL- 4"BRICK/.5"AIR SP/SHEATHING/4" INSUL/GYPBOARD
 4= WALL- 8"BLOCK
 5= WALL- 12" CONCRETE
 6= WALL- 12" BLOCK/2"AIR SP/ GYP BOARD
 7= WALL- 4"BRICK/2"AIR SP/6"BLOCK
 8= WALL- 4"BRICK/2"AIR SP/6"BLOCK/2"INSUL/GYP BOARD
 9= WALL- SHEET METAL/2" DNS INSUL/SHEET METAL
10= WALL- METAL SIDING/1"DNS INSUL/8"BLOCK/AIR/GYP BOARD
11= ROOF- BUILT-UP ROOF/2"INSULATION/METAL PAN
12= ROOF- BUILT-UP ROOF/3"CELL GLASS/METAL PAN
13= ROOF- SAME AS 12 BUT WITH SUSPENDED CIELING
14= ROOF- BUILT-UP ROOF/2"CELL GLASS/4"LW CONC/MET PAN/SUSP CIEL
15= ROOF- SHEET METAL/6" INSUL/GYP BOARD
16= ROOF- STANDARD PITCHED ROOF

ENTER TYPE OF ROOF (DEFAUT= 13.     - IF LIST DESIRED ENTER 100.)?? 13.

ENTER FLOOR DATA
  ENTER U FACTOR ?? .05
```

```
ENTER NUMBER OF OCCUPANTS  ?? 300.
ENTER AMOUNT OF LIGHTING (WATTS/SQFT)?? 2.67
ENTER EQUIPMENT ENERGY (KW)  ?? 20.4
ENTER INFILTRATION RATE (CHANGES /HR)?? 1.

ENTER SYSTEMS DATA

ENTER FAN SYSTEM CODE(DEF=1.- IF LIST DESIRED ENTER-100.)?? 100.

FAN SYSTEM CODES
 1= SINGLE ZONE W FACE & BYPASS DAMPERS
 2= MULTI-ZONE (NOT RECOMMENDED)
 3= DUAL - DUCT
 4= SINGLE ZONE W SUB-ZONE RH (NOT RECOMMENDED)
 5= UNIT VENTILATOR
 6= UNIT HEATER
 7= FLOOR PANEL HEATING(NO COOLING AVAIL)
 8= 2-PIPE FANCOIL
 9= 4-PIPE FANCOIL
10= 2-PIPE INDUCTION
11= 4-PIPE INDUCTION
12= VARIABLE VOLUME
13= CONSTANT VOLUME W REHEAT
++ FAN SYSTEMS 2 & 4 APPLY TO MORE THAN ONE ZONE.

ENTER SYSTEMS DATA

ENTER FAN SYSTEM CODE(DEF=1.- IF LIST DESIRED ENTER-100.)?? 12.

ENTER COOLING PLANT DATA
IF ANSWER TO QUESTION IS YES-ENTER YES, IF NO-HIT RETURN
  IS HEAT PUMP USED  ??
  IS AIR COOLED CHILLER USED ??
```

```
ENTER MISCELLENEOUS CARDS BELOW (A NULL LINE WILL TERMINATE)
? s19=10,4,1;  process loads
? s15=4;       steam absorption chiller
?

 DO YOU WISH TO LOOK AT THE DATA ?? yes
L1=SYSTEMS ENGINEERING BUILDING       ;
L1=NASA LANGLEY RESEARCH CENTER       ;
L1=R. N. JENSEN                       ;
L1=B1209            ;
L2=300.00; BLDG AZIMUTH
L13-F=,    662.00, .800,  0.0, 90.0;  FRONT  WINDOWS,
L11-F=,   2698.00, 8.0,  0.0, 90.0;  FRONT  DELAYED
L13-F=,    441.00, .800, 90.0, 90.0; RT SIDE WINDOWS,
L11-F=,   2639.00, 8.0, 90.0, 90.0; RT SIDE DELAYED
L13-F=,    662.00,0.000,180.0, 90.0;  REAR   WINDOWS,
L11-F=,   2698.00, 8.0,180.0, 90.0;  REAR   DELAYED
L13-F=,    441.00, .800,270.0, 90.0; LF SIDE WINDOWS,
L11-F=,   2639.00, 8.0,270.0, 90.0; LF SIDE DELAYED
L11-F=,  52800.00,13.0,  0.0,  0.0;  ROOF   DELAYED
L15-F=,  52800.00,     .0500; FLOOR
L17=,  52800.00,03,   300.,04,   2.6700,03,  20.4000,03,1,  1.000; MAIN ZONE
S11=  12.,028, 0; FAN SYSTEM
S19=10,4,1;  PROCESS LOADS
S15=4;       STEAM ABSORPTION CHILLER

 DO YOU WISH TO SUBMIT A RUN ?? yes
```

```
ENTER DELIVERY INFORMATION
? 8 bin11   m i n e r
ENTER USER NUMBER
? [redacted]
ENTER PASSWORD (HIT CR IF NOT USED)
? [redacted]
ENTER CHARGE NUMBER (DIGITS ONLY)
? [redacted]
 NECAP JOB WAS SUBMITTED.  HASH = YES
FASCAP COMPLETE
REVERT.    NECAP JOB IS SUBMITTED
/dayfile,op=*
 10.04.54. USER DAYFILE DUMPED.
 10.05.43./GET,NPC/UN=[redacted]
 10.05.55.$BEGIN,GONECAP,NPC.
 10.05.56.NOEXIT.
 10.05.56.GET,FASBIN/UN=[redacted]
 10.05.57.MAP,OFF.
 10.05.57.FASBIN.
 10.14.00.      END  FASCAP
 10.14.00.      27600 MAXIMUM EXECUTION FL.
 10.14.00.       .445 CP SECONDS EXECUTION TIME.
 10.14.00.RETURN,FASBIN.
 10.14.01.IFE,EF.NE.3,SKIPIT.
 10.14.01.SET,EF=0.
 10.14.01.SEND,TAPE10,M=R.
 10.14.02.FILE SENT TO MACHINE R.
 10.14.03.REVERT.    NECAP JOB IS SUBMITTED
 10.14.15.$DAYFILE,OP=I.
 USER DAYFILE DUMPED.
```

```
 1 L1=SYSTEMS ENGINEERING BUILDING      ;
 2 L1=NASA LANGLEY RESEARCH CENTER      ;
 3 L1=R. N. JENSEN                      ;
 4 L1=B1209          ;
 5 L2=300.00; BLDG AZIMUTH
 6 L13=F=,   662.00, .800,  0.0, 90.0;  FRONT  WINDOWS,
 7 L11=F=,  2698.00,  .8,  0.0, 90.0;  FRONT  DELAYED
 8 L13=F=,   441.00, .800, 90.0, 90.0; RT SIDE WINDOWS,
 9 L11=F=,  2639.00, 8.0, 90.0, 90.0; RT SIDE DELAYED
10 L13=F=,   662.00, .800,180.0, 90.0;  REAR  WINDOWS,
11 L11=F=,  2698.00, 8.0,180.0, 90.0;  REAR  DELAYED
12 L13=F=,   441.00, .800,270.0, 90.0; LF SIDE WINDOWS,
13 L11=F=,  2639.00, 8.0,270.0, 90.0; LF SIDE DELAYED
14 L11=F=, 52800.00,13.0,  0.0,  0.0;  ROOF  DELAYED
15 L15=F=, 52800.00,      .0500; FLOOR
16 L17=,  52800.00,23,   300.,24,   2.6700,23,  20.4000,23,1,  1.000; MAIN ZONE
17 S11=  12.,228, 0; FAN SYSTEM
18 S19=10,4,1;PROCESS LOADS
19 S15=4;ABSORPTION CHILLER
```

EXECUTIVE SUMMARY

SYSTEMS ENGINEERING BUILDING
NASA LANGLEY RESEARCH CENTER

THIS NECAP RUN PREPARED BY: R.N. JENSEN
ON: JUL 2, 1982

LOADS CASE IDENTIFICATION : B1209
SYSTEMS CASE IDENTIFICATION : SYSTEMS ENGINEERING BUILDING

INPUT SPECIFICATIONS

LENGTH OF STUDY =	365 DAYS	
TOTAL FLOOR AREA =	52800.00	
HEATING	1396.4 KBH,	.02645 /SQFT
COOLING	135.6 TNS	.00257 /SQFT
SUP AIR	78406.5 CFM	1.48497 /SQFT
VNT AIR	0.0 CFM	0.00000 /SQFT

ENERGY SOURCE	BUILDING CONSUMPTION	BUILDING LINE KBTU/SQ.FT.	RAW SOURCE KBTU/SQ.FT.
ELECTRICITY (KWHR)			
LIGHTS & MISC. EQUIP.	375484.84	24.27	82.52
HEATING	36097.47	2.33	7.93
COOLING	96119.81	6.21	21.12
FANS	90174.33	5.83	19.82
PROCESS	25100.00	1.62	5.52
TOTAL	622976.44	40.27	136.92
GAS (THERM)	NONE USED FOR THIS MODEL		
PURCHASED STEAM (KLBS) (1000 BTU/LB)			
HEATING	1602.94	30.36	42.20
COOLING	2852.07	54.02	75.08
PROCESS	0.00	0.00	0.00
TOTAL	4455.00	84.38	117.28
HEATING OIL (KGALS)	NONE USED FOR THIS MODEL		
DIESEL FUEL (KGALS)	NONE USED FOR THIS MODEL		
TOTAL ENERGY USAGE (EQUIV KBTU)	6581220.66	124.64	254.20

APPENDIX B

Appendix B contains the echo of the input and the default values used in the FAST NECAP run. Some of the output was edited out to make this appendix more compact. The SYSTEMS ENERGY SIMULATION OUTPUT is also included. Notes are included on the pages to point out where default values are used.

A more detailed explanation of the NECAP output is given in the NECAP USER'S MANUAL. The input and default values are explained in the NECAP INPUT MANUAL.

```
 1 C          NECAP FAST INPUT CARDS
 2 L1=SEB 81209/HAMPTON, VA/D.L. MINER /ONE ZONE MODEL;
 6 L11-F=,2978,8,0,90;WALL 1
 7 L11-F=,2749,8,90,90;WALL 2
 8 L11-F=,2978,8,180,90:WALL 3
 9 L11-F=,2749,8,270,90;WALL 4
10 L11-F=,53000,12,0,0;ROOF
11 L13-F=,662,.8,0,90:WINDOW 1
12 L13-F=,441,.8,90,90;WINDOW 2
13 L13-F=,662,.8,180,90;WINDOW 3
14 L13-F=,441,.8,270,90;WINDOW 4
15 L15-F=,12000,.1;FLOOR 1
16 L15-F=,41000,.02;FLOOR 2
17 L17=,53000,,,,300,,,,,2.67,,,,4.0,,,,1,1.0;MAIN ZONE
18 S11=12;VARIABLE VOLUME
19 C    MISCELANEOUS CARDS (OPTIONAL)
20 L2=300;BUILDING AZIMUTH
21 S19=10,4,1;PROCESS LOAD
22 S15=4;ARSORBTION CHILLER
```

EXPLAINATION

(1) The title card puts the header information into the program. Items included are: building name, location engineer, and project ID. (date is defaulted)

(2) Exterior surface cards all use the FAST format which requires: type of card, surface area, type of heat transfer input (depending on type of surface), azimuth and tilt. (standard cards may be used)

(3) Underground surface cards also use the FAST format but require only the surface area and U factor.

(4) The space card is used to input internal conditions which affect the space loads (area, people, lights, equipment, and infiltration).

(5) Fan system card is used to specify the type of distribution system that is to be simulated.

NOTE: IF SYSTEMS ENERGY SIMULATION PROGRAM is to be run, at least one "S" card must be input.

(6) Miscelaneous cards are used to overide or enhance NECAP's defaults. In this case, the building orientation, type of chiller, and a process load are specified in the input for the simulation.

****
****
***** *****
***** ECHO OF INPUT DATA *****
***** FOR THE LOAD PROGRAM *****
***** *****
****
****

GEOGRAPHICAL DATA:

LATITUDE = 37.00 CLEARNESS NUMBER(SUMMER) = .96 TIME ZONE = 5.00
LONGITUDE = 76.00 CLEARNESS NUMBER(WINTER) = .96 BLDG AZMTH = 300.00

PROCESSING PARAMETERS:

PROCESS CODE = 3 VENT AIR RATE = .100 COLD SUPPLY AIR TEMP = 52.0
EST. FAN PRES. = 2.000 HOT SUPPLY AIR TEMP = 120.0

HOURLY ANALYSIS PARAMETERS:

SELECTED YEAR = 1962 LENGTH OF STUDY = 365 DAYS
STARTING MONTH = JAN LNGTH OF XMAS SCHD = 0 DAYS
EST.TEMP = 39.0

HOURLY PRINTING IS OFF

NO. OF SCHEDULE TYPES 1.00

Azimuth angle was input. All other data was defaulted.
Environmental data defaulted to data from NECAP weather tape.

SCHEDULE TYPE 1 PERCENT OF LOAD

HOUR	--01	--02	--03	--04	--05	--06	--07	--08	--09	--10	--11	--12	--13	--14	--15	--16	--17	--18	--19	--20	--21	--22	--23	--24
SUN	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
MON	03	03	03	03	03	03	03	03	98	98	98	98	98	98	98	98	98	03	03	03	03	03	03	03
TUE	03	03	03	03	03	03	03	03	98	98	98	98	98	98	98	98	98	03	03	03	03	03	03	03
WED	03	03	03	03	03	03	03	03	98	98	98	98	98	98	98	98	98	03	03	03	03	03	03	03
THU	03	03	03	03	03	03	03	03	98	98	98	98	98	98	98	98	98	03	03	03	03	03	03	03
FRI	03	03	03	03	03	03	03	03	98	98	98	98	98	98	98	98	98	03	03	03	03	03	03	03
SAT	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
HOL	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
XMS	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Typical office load profile (DEFAULTED)

PROPERTIES OF WALLS AND ROOFS

THERE ARE 16 TYPES OF DELAYED SURFACES, 16 OF WHICH ARE STANDARD SURFACES

Only surfaces 8 and 12 are shown as they are the only ones referenced by this run.

DELAYED SURFACE TYPE NO. 8 (STANDARD SURFACE TYPE 8) — Used for exterior walls.

NO. OF TERMS, COMMON RATIO =	24	.8046447957	
XYZ RESPONSE FACTORS =	5.1760690615	.0000115877	.4439902914
	-3.2670838588	.0013777480	-.3138918862
	-.7557869855	.0068934014	-.0176965466
	-.3843689468	.0111441629	-.0043407542
	-.2111334742	.0119522028	-.0029676851
	-.1260887556	.0109942480	-.0023240584
	-.0818863673	.0094649507	-.0018494570
	-.0571435615	.0078925361	-.0014793520
	-.0420716914	.0064743214	-.0011864391
	-.0321059989	.0052647825	-.0009529141
	-.0250532825	.0042609730	-.0007659763
	-.0198101191	.0034396053	-.0006159898
	-.0157841950	.0027725923	-.0004954969
	-.0126309912	.0022331561	-.0003986293
	-.0101323213	.0017978824	-.0003207239
	-.0081390029	.0014470969	-.0002580549
	-.0065427869	.0011645958	-.0002076363
	-.0052618399	.0009371738	-.0001670707
	-.0042326699	.0007541313	-.0001344313
	-.0034052407	.0006068254	-.0001081689
	-.0027397611	.0004882868	-.0000870373
	-.0022044236	.0003929009	-.0000700340
	-.0017737284	.0003161472	-.0000563524
	-.0014271992	.0002543869	-.0000453437

DELAYED SURFACE TYPE NO. 12 (STANDARD SURFACE TYPE 12) — Used for roof.

NO. OF TERMS, COMMON RATIO =	9	.2026523314	
XYZ RESPONSE FACTORS =	2.0037117174	.0114439795	.6027205680
	-1.8493309263	.0645768947	-.4212625309
	-.0311971279	.0314422529	-.0526715341
	-.0054266640	.0071076824	-.0098951082
	-.0010810060	.0014594799	-.0019855447
	-.0002185981	.0002962520	-.0004018748
	-.0000442875	.0000600485	-.0000814282
	-.0000089747	.0000121693	-.0000165013
	-.0000018187	.0000024661	-.0000033440

THERE ARE 5 DELAYED SURFACES

DELAYED SURFACE NO. 1

ABSORBTANCE, REFLECTANCE, INF. COEFF. =	.75	.20	0.00				
INDICES =	1.00	1.00	1.00	0.00	2.00	8.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	2978.00	1.00	0.00	90.00

DELAYED SURFACE NO. 2

ABSORBTANCE, REFLECTANCE, INF. COEFF. =	.75	.20	0.00				
INDICES =	1.00	1.00	1.00	0.00	2.00	8.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	2749.00	1.00	90.00	90.00

DELAYED SURFACE NO. 3

ABSORBTANCE, REFLECTANCE, INF. COEFF. =	.75	.20	0.00				
INDICES =	1.00	1.00	1.00	0.00	2.00	8.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	2978.00	1.00	180.00	90.00

DELAYED SURFACE NO. 4

ABSORBTANCE, REFLECTANCE, INF. COEFF. =	.75	.20	0.00				
INDICES =	1.00	1.00	1.00	0.00	2.00	8.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	2749.00	1.00	270.00	90.00

DELAYED SURFACE NO. 5

ABSORBTANCE, REFLECTANCE, INF. COEFF. =	.75	.20	0.00				
INDICES =	1.00	1.00	1.00	0.00	2.00	12.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	53000.00	1.00	0.00	0.00

THERE ARE 0 DELAYED SURFACE PICTORAL OUTPUTS DESIRED

Only those items circled were input. Remainder of data defaulted to typical values.

THERE ARE 0 QUICK SURFACES

THERE ARE 4 WINDOW SURFACES

WINDOW NO. 1							
FACTORS =	(.80)	.50	.50	.20	0.00	0.00	
INDICES =	1.00	1.00	1.00	0.00	1.00	1.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	(662.00)	1.00	(0.00)	(90.00)
WINDOW NO. 2							
FACTORS =	(.80)	.50	.50	.20	0.00	0.00	
INDICES =	1.00	1.00	1.00	0.00	1.00	1.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	(441.00)	1.00	(90.00)	(90.00)
WINDOW NO. 3							
FACTORS =	(.80)	.50	.50	.20	0.00	0.00	
INDICES =	1.00	1.00	1.00	0.00	1.00	1.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	(662.00)	1.00	(180.00)	(90.00)
WINDOW NO. 4							
FACTORS =	(.80)	.50	.50	.20	0.00	0.00	
INDICES =	1.00	1.00	1.00	0.00	1.00	1.00	
X, Y, Z, HEIGHT, WIDTH, AZIMUTH, TILT =	0.00	0.00	0.00	(441.00)	1.00	(270.00)	(90.00)

THERE ARE 0 WINDOW SURFACE PICTORAL OUTPUTS DESIRED

Only those items circled were input. Remainder of data defaulted to typical values.

THERE ARE 0 INTERNAL H.T. SURFACES

THERE ARE 2 UNDERGROUND SURFACES

1 OF 2 UNDERGROUND SURFACES
AREA, HEAT TRANSFER COEFFICIENT = 12000.00 .10

2 OF 2 UNDERGROUND SURFACES
AREA, HEAT TRANSFER COEFFICIENT = 41000.00 .02

Underground surfece data was input.

GROUND TEMPERATURES

MONTH	TEMPERATURE
1	45.00
2	45.00
3	50.00
4	55.00
5	60.00
6	70.00
7	75.00
8	80.00
9	75.00
10	65.00
11	60.00
12	50.00

Defaulted to data or NECAP weather tape.

```
SPACE  1 OF    1 TOTAL SPACES HAS

*          5  DELAYED H.T.S.
*          0  QUICK H.T.S.
*          4  WINDOW H.T.S.
*          0  INTERNAL H.T.S.
*          2  UNDERGROUND SURFACES
*          0  ADDITIONAL IDENTICAL SPACES

-    53000.0  SQ FT FLOOR AREA
*   530000.0  CU FT VOLUME
         60.0  LBS/CU FT FLOOR WEIGHT
         72.0  F TEMPERATURE
-      300.0  PEOPLE
         450.0  BTU/HR ACTIVITY LEVEL
          0  SPACE SUMMATION PARAMETER
          0  PLENUM INDICATOR

         1.00  TYPE OF LIGHTING FIXTURE
         1.00  FRACTION OF LIGHT HEAT TO SPACE
         1.00  INFILTRATION CODE
-        1.00  INFILTRATION RATE
         0.00  HEIGHT FROM NEUTRAL ZONE
         0.00  EXHAUST AIR FLOW

     LIGHTING
-         2.7  WATTS/SQ FT
          0.0  KW

     EQUIPMENT
          0.0  WATTS/SQ FT
-         4.0  KW
          0.0  BTU/HR SENSIBLE
          0.0  BTU/HR LATENT

     SCHEDULES
            1  PEOPLE
            1  LIGHTING
            1  EQUIPMENT

     INDICES OF DELAYED SURFACE
*              1   2   3   4   5
     INDICES OF WINDOW SURFACE
*              1   2   3   4
     INDICES OF UNDERGROUND SURFACES
*              1   2
```

* = Data was computed from input.
- = Data was input on the I17 card.
ALL OTHER DATA defaulted to typical values.

```
**********************************************************************************
*                                                                                *
*                                                                                *
*                                IN THIS RUN                                     *
*                                                                                *
*                                                                                *
* - U. S. WEATHER BUREAU DATA FOR: LANGLEY AFB  VA      STATION #13702 IS USED   *
*                                                                                *
*                                                                                *
* - THIS STUDY STARTS ON THE FIRST HOUR OF JAN  1, 1962.                         *
*                                                                                *
*                                                                                *
* - THE LENGTH OF THIS STUDY IS 365 DAYS.                                        *
*                                                                                *
*                                                                                *
* - THE CONDITIONS AT THE START OF THE STUDY ARE:                                *
*                                                                                *
*    DRY BULB =  39          WIND SPEED =   4        PRESSURE = 3021             *
*    WET BULB =  34          WIND DIR.  = 203        CLOUD TYP=    8             *
*    DEW POINT=  26                                  CLOUD AMT=    2             *
*                                                                                *
*                                                                                *
**********************************************************************************
```

TLAP echo which gives environmental conditions at the beginning of the hourly loads calculation.

BUILDING LOAD SUMMARY FOR
SEB 81209
HAMPTON, VA

SPACE NOS. 1 THRU 1

TOTAL FLOOR AREA (SQ.FT.) 53000.

TOTAL VOLUME (CU.FT.) 530000.

SUMMER COOLING PEAK: AUG. 20 AT HOUR 18
DBT= 89 WBT= 79 WND SP= 12

WINTER HEATING PEAK: DEC. 31 AT HOUR 7
DBT= 15 WBT= 12 WND SP= 14

	***** SUMMER LOAD ***** SENSIBLE (BTUH)	LATENT (BTUH)	WINTER LOAD (BTUH)
WALLS	16466.	0.	-47448.
CEILINGS	171368.	0.	-332505.
WINDOW CONDUCTANCE	47566.	0.	-174057.
WINDOW SOLAR	82642.	0.	6443.
QUICK SURFACES	0.	0.	0.
INTERNAL SURFACES	0.	0.	0.
UNDERGROUND SURFACES	16160.	0.	-44440.
OCCUPANTS	78530.	44360.	5.
LIGHT TO SPACE	401907.	0.	36.
EQUIPMENT TO SPACE	12009.	0.	1.
INFILTRATION	158096.	420668.	-741046.
SUBTOTAL	984743.	465028.	-1333011.
RETURN AIR	0.	0.	0.
FAN HEAT	39076.	0.	39076.
VENTILATION AIR	91142.	234657.	-366183.
TOTAL	1114961.	699685.	-1660118.

TOTAL BUILDING COOLING 1814646. BTUH 151.2 TONS
TOTAL BUILDING HEATING -1660118. BTUH -1660.1 MBH

	******* VARIABLE VOLUME SYSTEM *******	******* CONSTANT VOLUME SYSTEM *******
SUPPLY AIR AT 52 F AT DIFFUSER	48674. CFM .92 CFM/SQ.FT. MAX.	48674. CFM .92 CFM/SQ.FT. CONST.
SUPPLY AIR AT 120 F AT DIFFUSER	22911. CFM .43 CFM/SQ.FT. MAX.	22911. CFM .43 CFM/SQ.FT. CONST.

*****ECHO OF BUILDING DESCRIPTION DATA READ FROM INPUT TAPE*****

FAC= SEB B1209
CITY= HAMPTON, VA
ENGR=D.L. MINER
PROJ=ONE ZONE MODEL
DATE=JUL 27, 1982

NO. OF TYPES OF RESPONSE FACTOR SURFACES NRF= 16

The SYSTEMS program will echo the building data it uses in determining space response factors. The data was processed by TLAP and send in via the BUILDING DATA tape.

The data for this study is the same as given in the TLAP data echo and therefore is not shown here.

********** ECHO OF CARD INPUT TO THE SESP PROGRAM **********

CARD S1: PROJECT NAME - SEB B1209

CARD S2: GENERAL DATA

1	HOUR OF YEAR AT WHICH SIMULATION MAY BEGIN
8760	HOUR OF YEAR AT WHICH SIMULATION MAY END
0	OUTPUT TAPE OPTION FLAG

CARD S3: PRINTOUTS

0 - NUMBER OF PRINTOUTS DESIRED

All data defaults using TLAP simulation scheduling for the run.

CARD S4: THERMOSTAT SCHEDULES

2 - NUMBER OF THERMOSTAT SCHEDULES

THERMOSTAT NUMBER 1

HOUR OF DAY	THERM TYPE	HI LIMIT	LOW LIMIT
1	2	95.000	55.000
2	2	95.000	55.000
3	2	95.000	55.000
4	2	95.000	55.000
5	2	95.000	55.000
6	2	95.000	55.000
7	2	95.000	55.000
8	2	77.000	69.000
9	2	77.000	69.000
10	2	77.000	69.000
11	2	77.000	69.000
12	2	77.000	69.000
13	2	77.000	69.000
14	2	77.000	69.000
15	2	77.000	69.000
16	2	77.000	69.000
17	2	77.000	69.000
18	2	95.000	55.000
19	2	95.000	55.000
20	2	95.000	55.000
21	2	95.000	55.000
22	2	95.000	55.000
23	2	95.000	55.000
24	2	95.000	55.000

Defaults to a special (office) type thermostat.

THERMOSTAT NUMBER 2

HOUR OF DAY	THERM TYPE	HI LIMIT	LOW LIMIT
1	2	95.000	55.000
2	2	95.000	55.000
3	2	95.000	55.000
4	2	95.000	55.000
5	2	95.000	55.000
6	2	95.000	55.000
7	2	95.000	55.000
8	2	95.000	55.000
9	2	95.000	55.000
10	2	95.000	55.000
11	2	95.000	55.000
12	2	95.000	55.000
13	2	95.000	55.000
14	2	95.000	55.000
15	2	95.000	55.000
16	2	95.000	55.000
17	2	95.000	55.000
18	2	95.000	55.000
19	2	95.000	55.000
20	2	95.000	55.000
21	2	95.000	55.000
22	2	95.000	55.000
23	2	95.000	55.000
24	2	95.000	55.000

Non-workday thermostat

CARD S5: REGULAR DAILY SCHEDULES

2 - NUMBER OF REGULAR DAILY SCHEDULES

THE FOLLOWING LINE(S) ARE USER DEFINED SCHEDULES

SCHDULE, NUMBER	HOUR OF DAY 1---2---3---4---5---6---7---8---9---10--11--12--13--14--15--16--17--18--19--20--21--22--23--24
1	0.000.000.000.000.000.000.001.001.001.001.001.001.001.001.001.000.000.000.000.000.000.000.000.00
2	0.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.000.00

Default fan and process load schedule

CARD S6: WEEKLY SCHEDULES

1 - NUMBER OF WEEKLY SCHEDULE GROUPS

SCHEDULE NO.	TYPE OF SCHED.	SUN	MON	TUE	WED	THU	FRI	SAT	HOL
1	BOTH	2.	1.	1.	1.	1.	1.	2.	2.

Default weekly schedule which assigns the daily thermostat and operating schedules to a day of the week.

CARD S7: YEARLY SCHEDULES

1 - NUMBER OF YEARLY SCHEDULE GROUPS

YEARLY SCHED. GROUP NO.	WEEKLY SCHED. NO.	STARTING HOUR
1	1	1
	2	0 8785
	3	0 8785
	4	0 8785
	5	0 8785

Default seasonal schedule which assigns the weekly schedule to be in effect for a given period of time (in this case, year round).

CARD S8: RESET SCHEDULES

0 - NUMBER OF RESET SCHEDULES

CARDS S9 & S10:USER DEFINED SURFACES,

0 - NUMBER OF USER DEFINED SURFACES

CARD S11: FAN CARD

1 - NUMBER OF ENERGY DISTRIBUTION SYSTEMS

	FAN SYSTEM NUMBER 1	CARD FIELD
*	12.0 TYPE OF DISTRIBUTION SYSTEM: VARIABLE VOLUME	1
	1.0 NO. OF ZONES ON SYSTEM	2
	10.0 RELATIVE HUMIDITY SETPOINT	3
	0.0 MINIMUM OUTSIDE AIR	4
	1.0 MIXED AIR OPTION	5
	2.0 VARIABLE VOLUME FAN CONTROL TYPE	6
	5.00 SUPPLY FAN PRESSURE	9
	0.00 RETURN FAN PRESSURE	10
	.5 EXHAUST FAN PRESSURE	11
	1.0 VAV REHEAT COIL OPTION	12
	40.0 VAV BOX MINIMUM AIR (PCT)	13
	55.0 HOT DECK/AHU DISCHARGE TEMP.	14
	0.0 BASEBOARD RADIATION SCHEDULE	18
	3.0 FAN SYSTEM SHUTOFF CODE	27
	1.0 VENTILATION SCHEDULE CODES	28
	1.0 HUMIDISTAT LOCATION	29
	0.0 DX/HEAT PUMP INDEX	30

* = Data was input on the S11 card.
All other data defaulted to typical values.

CARD S12: ZONE DATA

1 - NUMBER OF ZONES

SYSTEMS ZONE NO. 1

0 TYPE OF ZONE (0=NON-PLENUM,1=PLENUM)

1 FAN SYSTEM INDEX

1.0 LOADS SPACE NO.

* 0.00 SUPPLY AIR CFM
0.00 EXHAUST AIR CFM

0.00 BASEBOARD OUTPUT
0.00 ACTIVE LENGTH OF BASEBOARD

1.0 YEARLY THERMOSTAT SCHEDULE INDEX

* 1. SPACE DESIGN HEATING CAPACITY
* -1. SPACE DESIGN COOLING CAPACITY

10.000 WEIGHT OF FURNISHINGS
1.000 MULTIPLICATION FACTOR
0.000 PLENUM NUMBER ABOVE SPACE

> Entire card was defaulted. Items with an "*" show values that will be computed once all of the building and systems data is initialized.

CARD S13: ENGINE/GENERATOR CARD

0 - NUMBER OF DIFFERENT ON-SITE ENGINE/GENERATOR SETS

CARD S14: BOILER CARD

1 - NUMBER OF DIFFERENT TYPES OF BOILERS

VARIABLES COMMON TO ALL BOILERS

1 HOUR OF SEASONAL BOILER START-UP

8760 HOUR OF SEASONAL BOILER SHUT-DOWN

0. SOURCE OF REHEAT COIL ENERGY

150000.0 HEATING VALUE HEATING OIL

BOILER NO. 1

0 BOILER COMPONENT SIMULATION OPTION CODE

1.0 NUMBER OF THIS TYPE OF BOILER

0.0 SIZE OF BOILER (KBH)

3. SOURCE OF HEATING ENERGY

Entire card was defaulted. The capacity will be computed once all of the building and systems data is initialized.

CARD S15: CHILLER CARD

1 - NUMBER OF DIFFERENT TYPES OF CHILLERS

VARIABLES COMMON TO ALL CHILLERS

1 HOUR OF SEASONAL CHILLER START-UP

8760 HOUR OF SEASONAL CHILLER SHUT-DOWN

10.0 MINIMUM PART LOAD CUT-OFF FOR CHILLERS

45.0 CHILLED WATER SET POINT TEMP

CHILLER NO. 1

0 CHILLER COMPONENT SIMULATION OPTION CODE

\- 4 TYPE OF CHILLER

1 NUMBER OF THIS TYPE OF CHILLER

* 0.0 SIZE OF EACH CHILLER (TONS)

3 SOURCE OF CHILLER ENERGY

This card was input as a miscelaneous card. Only the type of chiller "-" was specified. All other data was defaulted with typical values except for chiller size "*", which will be computed once all of the building and systems data is initialized.

CARD S16: COOLING TOWER CARD

0 COOLING TOWER SIMULATION OPTION CODE

75.0 COOLING TOWER WATER LOW LIMIT TEMPERATURE

10.0 CONDENSER WATER TEMP. RISE (F)

0.0 COOLING TOWER PEAK POWER (KW)

CARD S17: DX/HEAT PUMP CARD

0 - NUMBER OF DX AND HEAT PUMP UNITS

CARD S18: PUMP PARAMETERS

50.0 TOTAL BOILER WATER PUMP HEAD (FT.)

40.0 TOTAL CHILLED WATER PUMP HEAD (FT.)

30.0 TOTAL CONDENSER WATER PUMP HEAD (FT.)

85.0 FAN AND PUMP MOTOR EFFICIENCY (PCT)

These cards were defaulted using typical values.

CARD S19: PROCESS LOAD CARDS

1 - NUMBER OF PROCESS LOADS

PROCESS LOAD NO. 1

10.0 PEAK LOAD

4.0 ENERGY SOURCE CODE

1.0 OPERATING SCHEDULE NUMBER

The S19 card was input as a miscelaneous card. All of the data was input.

CARD S20: STEAM AND OTHER MISC. PARAMETERS

BOILER SUPPLY/ ABSORPTION CHILLER DATA

12.0 ENTERING STEAM PRESSURE

245.0 ENTERING STEAM TEMPERATURE

STEAM TURBINE DATA

125.0 ENTERING STEAM PRESSURE

353.0 ENTERING STEAM TEMPERATURE

3600.0 TURBINE SPEED (RPM)

MISC. DATA

0.0 EXTERNAL LIGHTING POWER

FLOOR PANEL HEATING DATA

1.0 TYPE OF FLOOR COVERING

0.0000 FLOOR INSULATION CONDUCTANCE

0.0000 FLOOR INSULATION THICKNESS

This card was defaulted using typical values.

SEB B1209 HAMPTON, VA JUL 27, 1982 ONE ZONE MODEL
SYSTEM SIMULATION AND ENERGY ANALYSIS

SUMMARY OF ENERGY DISTRIBUTION SYSTEM CHARACTERISTICS.

SYSTEM NO.	TYPE	++++++ TOTAL FAN BHP +++++ SUPPLY	RETURN	EXHAUST	NO. OF ZONES	++TOTAL SYSTEM AIR FLOWS (CFM)++ SUPPLY	MIN.O.A.	EXH.SYSTEM	PER-CENT MIN.O.A.
1	VAVS	119.5	0.0	0.0	1	(77352.)	0.	0.	0.0

High CFM due to high loads for morning start-up.

SUMMARY OF ZONE AIR FLOWS

FAN SYSTEM	ZONE NUMBER	LOAD SPACE NUMBER	MULT FACTOR	SUPPLY CFM	EXHAUST CFM	LOAD SET POINT TEMP.	COOLING CAPACITY BTU/HR	HEATING CAPACITY BTU/HR	YEARLY THERMOSTAT SCHEDULE
1	1	1	1	(77352.)	0.	72.	(1449771.)	(-1333011.)	1

Circled items on this page were calculated based upon data which was computed in the TLAP portion of NECAP.
All other data was defaulted except for the type of fan system.

SUMMARY OF EQUIPMENT SIZES

TOTAL NUMBER OF CHILLERS = 1
- TYPE OF CHILLER = STEAM ABSORPTION
- NO. OF CHILLERS = 1
- SIZE OF CHILLERS = (133.8 TONS)

TOTAL NUMBER OF BOILERS = 1
- TYPE OF BOILER = STEAM
- NO. OF BOILERS = 1
- SIZE OF BOILERS = (1488.3 KBTU)

TOTAL HEATING CAPACITY = (1488.3 KBTU)
TOTAL COOLING CAPACITY = (133.8 TONS)

IF USED, TERMINAL REHEAT ENERGY SAME SOURCE AS BOILER.

COOLING TOWER FAN REQUIREMENT (46813. CFM) 1.0 IN. S.P. (8.7 RHP)

BOILER AUXILIARY HORSEPOWER REQUIREMENT (FAN,BLOWER,PUMP) (2.2 RHP)

TOTAL FAN PLANT HORSEPOWER FOR BUILDING (119.5 RHP)

SUMMARY OF PUMP SIZES

LOCATION	TOTAL GPM	TOTAL HEAD (FT)	TOTAL RHP
CHILLED WATER	(321.)	40.0	(6.4)
CONDENSER WATER	(468.)	30.0	(7.0)
HEATING WATER	(149.)	50.0	(3.7)

All circled items were computed based upon data received from the TLAP routine. Underlined items were from defaulted input which uses typical values.

SPACE TEMPERATURE FREQUENCY DISTRIBUTION SUMMARY

SPACE NO.	SPACE STATUS	BELOW 50.0	50.0- <60.0	60.0- <65.0	65.0- <68.0	68.0- <70.0	70.0- <72.0	72.0- <74.0	74.0- <76.0	76.0- <78.0	78.0- <80.0	80.0- <85.0	85.0- <90.0	90.0- <100.0	100.0- <110.0	110.0- <120.0	120.0- & OVER
	* * * * * * * * * * * * * * * * TEMPERATURE OCCURANCE BANDS (F) * * * * * * * * * * * * * * * *																
1	OCCUPIED	0	0	0	6	362	444	451	492	504	0	0	0	0	0	0	0
	UNOCCUPIED	0	0	132	692	1183	1181	1467	1342	480	0	0	0	0	0	0	0

The temperature summary is printed after the simulation period is completed. The occupied hours are when more than 25% or the people are scheduled to be in the space.

The following pages contain NECAP's energy summaries. The first is the monthly and annual summary which provides a complete breakdown of energy usage. The EXECUTIVE summary follows providing a single page report with information for the entire run. Finally, the ECONOMIC summary is given which shows a typical set of owning and operating costs based upon the assumed data.

***** MONTHLY AND ANNUAL ENERGY AND UTILITY USE SUMMARY *****

FACILITY - SEB 81209 DATE - JUL 27, 1982
CITY - HAMPTON, VA PROJECT - ONE ZONE MODEL
USER - D.L. MINER

ENERGY CONSUMPTION

	JAN.	FEB.	MARCH	APRIL	MAY	JUNE
MONTHLY KBTU						
HEAT (KHB)						
MAX. DEMAND	-1549.8	-1517.8	-1561.1	-1479.0	-750.2	-750.4
CONSUMPTION	-145812.6	-113513.3	-133328.5	-130045.4	-142372.3	-134871.1
COOL (KCB)						
MAX. DEMAND	1797.6	2017.0	2099.6	1467.4	1544.7	1373.8
CONSUMPTION	135619.9	117472.7	142703.5	146029.3	188925.6	211090.2
ELECTRICITY						
LIGHTS AND BUILDING EQUIPMENT						
INTERNAL						
DEMAND(KW)	142.6	142.6	142.6	142.6	142.6	142.6
CONS.(KWH)	29675.3	25628.7	29675.3	28326.4	29675.3	28326.4
HEAT (INCL. CENT.PLT.HTG. LOAD, BLR.AUXIL., HOT WATER PUMPS, AND HEATPUMPS)						
DEMAND(KW)	4.4	4.4	4.4	4.4	4.4	4.4
CONS.(KWH)	3170.9	2959.5	3276.5	3170.9	3276.5	3170.9
COOL (INCL. CHILLERS, WATER PUMPS, COOLING TOWER FAN, DX, AND HEATPUMPS)						
DEMAND(KW)	13.0	13.7	13.2	16.4	16.4	16.4
CONS.(KWH)	7375.4	6910.6	7704.9	7652.3	8386.4	8334.4
FANS						
DEMAND(KW)	89.1	89.1	89.1	89.1	89.1	89.1
CONS.(KWH)	7797.4	6734.1	7797.4	7443.0	7797.4	7443.0
PROCESS ELECTRICITY						
DEMAND(KW)	10.0	10.0	10.0	10.0	10.0	10.0
CONS.(KWH)	2200.0	1900.0	2200.0	2100.0	2200.0	2100.0
TOTAL						
DEMAND(KW)	195.4	196.1	195.7	198.8	198.8	198.8
CONS.(KWH)	50219.0	44132.9	50654.1	48692.6	51335.6	49374.7

***** MONTHLY AND ANNUAL ENERGY AND UTILITY USE SUMMARY *****

FACILITY - SEB 81209 DATE - JUL 27, 1982
CITY - HAMPTON, VA PROJECT - ONE ZONE MODEL
USER - D.L. MINER

ENERGY CONSUMPTION

	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
MONTHLY KBTU							
HEAT (KHB)							
MAX. DEMAND	-750.4	-749.8	-748.8	-749.1	-1514.1	-1560.3	
CONSUMPTION	-130022.4	-139857.9	-122631.2	-138108.6	-115025.3	-125339.1	-1570927.7
COOL (KCB)							
MAX. DEMAND	1373.7	1460.3	1258.8	2102.8	2127.7	723.0	
CONSUMPTION	200498.2	228711.9	160483.8	168199.9	137914.4	109851.2	1947500.5
ELECTRICITY							
LIGHTS AND BUILDING EQUIPMENT							
INTERNAL							
DEMAND(KW)	142.6	142.6	142.6	142.6	142.6	142.6	
CONS.(KWH)	28326.4	31024.2	25628.7	29675.3	26977.6	25628.7	338568.3
HEAT (INCL. CENT.PLT.HTG. LOAD, BLR.AUXIL., HOT WATER PUMPS, AND HEATPUMPS)							
DEMAND(KW)	4.4	4.4	4.4	4.4	4.4	4.4	
CONS.(KWH)	3276.5	3276.5	3170.9	3276.5	3170.9	3276.5	38473.0
COOL (INCL. CHILLERS, WATER PUMPS, COOLING TOWER FAN, DX, AND HEATPUMPS)							
DEMAND(KW)	16.4	16.4	16.4	16.4	13.1	12.0	
CONS.(KWH)	8602.1	8777.3	7948.2	8101.9	7483.7	7544.1	94821.3
FANS							
DEMAND(KW)	89.1	89.1	89.1	89.1	89.1	89.1	
CONS.(KWH)	7443.0	8151.9	6734.1	7797.4	7088.6	6734.1	88961.6
PROCESS ELECTRICITY							
DEMAND(KW)	10.0	10.0	10.0	10.0	10.0	10.0	
CONS.(KWH)	2100.0	2300.0	1900.0	2200.0	2000.0	1900.0	25100.0
TOTAL							
DEMAND(KW)	198.8	198.8	198.8	198.8	195.5	194.5	
CONS.(KWH)	49748.1	53529.9	45381.9	51051.2	46720.7	45083.5	585924.1

***** MONTHLY AND ANNUAL ENERGY AND UTILITY USE SUMMARY *****

FACILITY - SEB B1209 DATE - JUL 27, 1982
CITY - HAMPTON, VA PROJECT - ONE ZONE MODEL
USER - D.L. MINER

ENERGY CONSUMPTION

	JAN.	FEB.	MARCH	APRIL	MAY	JUNE
PURCHASED STEAM						
HEAT (12.0PSIG 245.0DEG.F. ENTERING)						
DEMAND (K-LBS/HR)	1.4	1.4	1.4	1.5	.8	.8
CONS.(K-LBS)	144.7	114.3	133.9	131.6	144.0	136.5
COOL (125.0PSIG 353.0DEG.F. ENTERING)						
DEMAND (K-LBS/HR)	2.2	2.2	2.2	2.3	2.5	2.2
CONS.(K-LBS)	191.8	165.0	200.0	207.8	273.6	312.3
OIL						
CITY WATER						
DEMAND (K-GALS/HR)	.6	.7	.7	.5	.5	.5
CONS. (K-GALS)	21.2	18.4	22.4	22.9	29.6	33.1

***** MONTHLY AND ANNUAL ENERGY AND UTILITY USE SUMMARY *****

FACILITY - SEB 81209 DATE - JUL 27, 1982
CITY - HAMPTON, VA PROJECT - ONE ZONE MODEL
USER - D.L. MINER

ENERGY CONSUMPTION

	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
PURCHASED STEAM							
HEAT (12.0PSIG 245.0DEG.F. ENTERING)							
DEMAND (K-LBS/HR)	.8	.8	.8	.8	1.4	1.4	
CONS.(K-LBS)	131.5	141.5	124.1	139.7	116.0	124.5	1582.3
COOL (125.0PSIG 353.0DEG.F. ENTERING)							
DEMAND (K-LBS/HR)	2.2	2.4	1.9	2.2	2.8	1.0	
CONS.(K-LBS)	295.0	339.8	232.4	237.5	193.1	154.5	2802.8
OIL							
CITY WATER							
DEMAND (K-GALS/HR)	.5	.5	.4	.7	.7	.2	
CONS. (K-GALS)	31.4	35.8	25.1	26.3	21.6	17.2	305.0

********** **********

* EXECUTIVE SUMMARY *

SEB B1209 *

HAMPTON, VA **********

* INPUT SPECIFICATIONS

THIS NECAP RUN PREPARED BY: D.L. MINER

ON: JUL 27, 1982

LOADS CASE IDENTIFICATION : ONE ZONE MODEL

SYSTEMS CASE IDENTIFICATION : SEB B1209

LENGTH OF STUDY = 365 DAYS

TOTAL FLOOR AREA = 53000.00

HEATING 1488.3 KBH, .02808 /SQFT

COOLING 133.8 TNS .00252 /SQFT

SUP AIR 77352.1 CFM 1.45947 /SQFT

VNT AIR 0.0 CFM 0.00000 /SQFT

-----ENERGY SOURCE-----	-----BUILDING----- CONSUMPTION	--BUILDING LINE-- KBTU/SQ.FT.	---RAW SOURCE--- KBTU/SQ.FT.
ELECTRICITY (KWHR)			
LIGHTS & MISC. EQUIP.	338568.30	21.80	74.13
HEATING	38473.01	2.48	8.42
COOLING	94821.26	6.11	20.76
FANS	88961.58	5.73	19.48
PROCESS	25100.00	1.62	5.50
TOTAL	585924.14	37.73	128.29
GAS (THERM)	NONE USED FOR THIS MODEL		
PURCHASED STEAM (KLBS) (1000 BTU/LB)			
HEATING	1582.34	29.86	41.50
COOLING	2802.81	52.88	73.51
PROCESS	0.00	0.00	0.00
TOTAL	4385.15	82.74	115.01
HEATING OIL (KGALS)	NONE USED FOR THIS MODEL		
DIESEL FUEL (KGALS)	NONE USED FOR THIS MODEL		
TOTAL ENERGY USAGE (EQUIV KBTU)	6384911.10	120.47	243.29

********** * ECONOMIC SUMMARY * **********

SEB B1209 — HAMPTON, VA

THIS NECAP RUN PREPARED BY: D.L. MINER
ON: JUL 27, 1982

LOADS CASE IDENTIFICATION : ONE ZONE MODEL
SYSTEMS CASE IDENTIFICATION : SEB B1209

ASSUMED ECONOMIC FACTORS:

BUILDING LIFE	40 YRS
ANNUAL INTREST RATE	10.0 %
ANNUAL LABOR WAGE INCR.	8.0 %
ANNUAL MATERIAL COST INCR.	10.0 %
ANNUAL FLOOR SPACE COST INCR.	8.0 %
ANNUAL ENERGY COST INCR.	10.0 %

ENERGY COSTS

ENERGY SOURCE / USE	ESTIMATED ENERGY COST/UNIT ($) CONS.	DEMAND	COMPUTED FR. SIMUL. CONSUMPTION	DEMAND	YRLY TOTAL ENERGY COST($)	ANNUITY ($)
ELECTRICITY						
ELEC LTS. HEAT COOL FANS PRC.	.035	20.00	585924.	199. KW	24484.	100149.
STEAM						
STM. HEAT COOL	5.00	-	4385.	- K LBS	21926.	89685.
WATER						
PRC. WATR	1.20	-	305.	- K GALS	366.	1497.
TOTAL ENERGY COST					46776.	191331.

COSTS ARE BASED ON:
HEATING EQUIP - $40./KBTU
COOLING EQUIP -$3000./TON
20 YEARS ANTICIPATED LIFE
10 YEARS MAJOR OVERHAUL
NO RESALE VALUE ALLOWED

EQUIPMENT COSTS

MAINTENANCE & OVERHAUL COSTS BASED ON:
1% OF EQUIP COST FOR MAINT & OH LABOR
.5% OF EQUIP COST FOR MAINT MATERIALS
1% OF EQUIP COST FOR OVERHAUL MATERIALS
10% OF EQUIP COST FOR FLOOR SPACE

	INITIAL COST	OVERHAUL COST LABOR	OVERHAUL COST MATERIAL	ANNUAL MAINTENACE LABOR	ANNUAL MAINTENACE MATERIAL	FLOOR SP. COST	ANNUITY ($)
BOILERS	59530.	595.	595.	595.	298.	5953.	38684.
CHILLERS	401254.	4013.	4013.	4013.	2006.	40125.	260742.
TOTAL SYSTEMS & EQUIPMENT ANNUITY							299426.
TOTAL OWNING & OPERATING ANNUITY							490757.

NOTE -- ANNUITY IS CONSTRUED TO MEAN THE UNIFORM ANNUAL COST, CONSIDERING ALL THE LISTED COSTS TO THE OWNER DURING THE LIFE TIME OF THE BUILDING.

APPENDIX C

NECAP INPUT FORMS USED FOR FAST METHOD

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)	Location (35 char max)
L1= /	;

Engineer (35 char max)	Project No. (15 char max)
L1= /	;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=	;	1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)		Location (35 char max)	
L1=	/		;

Engineer (35 char max)		Project No. (15 char max)	
L1=	/		;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=, ,,,,	,,,,	,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=	;	1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)		Location (35 char max)	
L1=	/		;

Engineer (35 char max)		Project No. (15 char max)	
L1=	/		;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=		1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)	Location (35 char max)
L1= /	;

Engineer (35 char max)	Project No. (15 char max)
L1= /	;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11= ;		1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)		Location (35 char max)	
L1=	/		;

Engineer (35 char max)		Project No. (15 char max)	
L1=	/		;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=	;	1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)	Location (35 char max)
L1= /	;

Engineer (35 char max)	Project No. (15 char max)
L1= /	;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;
L	-F=,	,	,	,	;

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=	;	1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)	Location (35 char max)
L1= /	

Engineer (35 char max)	Project No. (15 char max)
L1= /	

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=	;	1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max) Location (35 char max)

L1= / ;

Engineer (35 char max) Project No. (15 char max)

L1= / ;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

L -F=, , , , ;

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type Comment

S11= ; 1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)		Location (35 char max)	
L1=	/		;

Engineer (35 char max)		Project No. (15 char max)	
L1=	/		;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	
L	-F=,	,	,	,	;	

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=	;	1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

NOTES

NECAP FAST INPUT FORM

TITLE CARD

Fac. Name (35 char max)	Location (35 char max)
L1= /	;

Engineer (35 char max)	Project No. (15 char max)
L1= /	;

SURFACE CARDS

Surface	Area	Type	Azimuth	Tilt	Comment
11-F=DELAY...	sqft	Code Type	0° = South	0 = Roof	
12-F=QUICK...	"	"U" Factor	90° = East	90 = Vert Wall	
13-F=GLAZED..	"	Shade Coeff	etc.	etc.	
15-F=UNDRG...	"	"U" Factor	N/A	N/A	

L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;
L	-F=,	,	,	,	,	;

SPACE CARD

Area (sq ft)	NO. People	Lights (Watts/sf)	Equip (KW)	Infil (Change/Hr)	Comment
L17=,	,,,,	,,,,,	,,,,	,,,,1,	;

EQUIPMENT CARD

Type	Comment	
S11=		1=SZ,2=MZ,3=DD,5=UVT,6=UHT,7=FPH,8=2PFC,9=4PFC,10=2PI,11=4PI,12=VV 13=Reh

MISC CARDS

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA TM 83241		

4. Title and Subtitle	5. Report Date
NECAP 4.1 - NASA'S ENERGY-COST ANALYSIS PROGRAM FAST INPUT MANUAL AND EXAMPLE	August 1982
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
*Ronald N. Jensen and **David L. Miner	
9. Performing Organization Name and Address	10. Work Unit No.
NASA Langley Research Center Hampton, VA 23665	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Technical Memorandum
National Aeronautics and Space Administration Washington, DC 20546	14. Sponsoring Agency Code

15. Supplementary Notes

*NASA Langley Research Center, Hampton, Virginia
**Computer Sciences Corporation, Hampton, Virginia

16. Abstract

NASA's Energy-Cost Analysis Program (NECAP) is a powerful computerized method to determine and to minimize building energy consumption. The program calculates hourly heat gain or losses taking into account the building thermal resistance and mass, using hourly weather and a "response factor" method. Internal temperatures are allowed to vary in accordance with thermostat settings and equipment capacity.

NECAP 4.1 is a updated version of NECAP published in 1975 (see CR2590, Parts I and II). It has a simplified input procedure and numerous other technical improvements. Documentation consist of a Users Manual, Engineering Manual, Input Manual, Fast Input Manual and Example, Engineering Flow Chart Manual and an Operations Manuals (specifically for LaRC's Computer System).

This manual provides the user with a very short input method. It is limited to a single zone building. The user must still describe the building's outside geometry and select the type of system to be used.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Energy Energy Conservation Energy Analysis Air Conditioning and Heating	Unclassified - Unlimited Subject Category 44

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	73	A04

N-305

For sale by the National Technical Information Service, Springfield, Virginia 22161

NASA-Langley, 1982